IN THE SPECIFICATION

Please amend prenumbered paragraph [0006], on page 2, as follows:

The present invention relates to a method for manufacturing a glass optical element having at least one concave surface, ~~comprising the steps of~~ including:

softening a glass molding material by heating,

molding the softened material with a first mold having a first molding surface and a second mold having a second molding surface by applying a pressure, the first molding surface ~~comprising~~ includes a first concave forming surface, the second molding surface ~~comprising~~ includes a convex forming surface, a planar forming surface or a second concave forming surface, the second concave forming surface having a curvature radius greater than that of [[said]] the first concave forming surface,

whereby shapes of the first molding surface and the second molding surface are transferred to the material,

cooling the material so that a temperature of the material reaches a temperature equal to or lower than glass transition temperature (Tg), and

removing the cooled material from either of [[said]] the first mold or [[said]] the second mold,

~~wherein~~ where in the cooling step, a second temperature of [[said]] the second mold reaches the glass transition temperature prior to a time when a first temperature of [[said]] the first mold reaches the glass transition temperature.

Please amend prenumbered paragraph [0008], on page 3, as follows:

One of the embodiments of the present manufacturing method (Manufacturing Method 1) is that for glass optical elements, in which one optically functional surface is concave, ~~comprising steps of~~ and includes:

softening a glass molding material by heating

press-molding the heat-softened glass molding material with a forming mold ~~comprising~~ including an upper mold and a lower mold with molding surfaces for forming the optically functional surfaces of the glass optical element to be molded, one of these molding surfaces being a concave forming surface and the other being a convex forming surface or a flat forming surface, thereby transferring shapes of the molding surfaces to the glass material being molded;

cooling the forming mold to cool the molded glass to a temperature equal to or lower than the glass transition temperature (Tg) of the glass; and

removing the cooled glass from the forming mold;

~~wherein~~ where the cooling is conducted such that the temperature ta2 of the mold with the convex forming or flat forming molding surface reaches Tg before the temperature ta1 of the mold with the concave forming molding surface.

Please amend prenumbered paragraph [0009], starting on page 3, as follows:

The second embodiment of the present manufacturing method (Manufacturing Method 2) is that for glass optical elements in which both optically functional surfaces are concave, ~~comprising steps of~~ including:

softening a glass molding material by heating

press-molding the heat-softened glass molding material with a forming mold ~~comprising~~ including an upper mold and a lower mold with molding surfaces for forming the

optically functional surfaces of the glass optical element to be molded, both of these molding surfaces being concave forming surfaces, thereby transferring shapes of the molding surfaces to the glass material being molded;

cooling the forming mold to cool the molded glass to a temperature equal to or lower than the glass transition temperature (Tg) of the glass; and

removing the cooled glass from the forming mold;

~~wherein~~ where the cooling is conducted such that the temperature tb2 of the mold with molding surface having the larger radius of curvature reaches Tg before the temperature tb1 of the mold with the molding surface having the smaller radius of curvature.

Please amend prenumbered paragraph [0010], starting on page 4, as follows:

~~[~~Brief Description of the Drawings~~]~~

~~Fig. 1 shows~~ Figures 1(A)-1(C) show glass optical elements ~~(A), (B), and (C)~~ that are manufactured by the method of the present invention.

Fig. 2 is a drawing descriptive of a concave meniscus lens in which a flat portion perpendicular to the optical axis is provided on the outside of the optically functional surface.

Fig. 3 shows typical changes over time in the temperatures of the two molds (upper mold, lower mold) in the manufacturing method of the present invention.

Fig. 4 is a schematic diagram of the molding device employed in Examples 1-3 and Comparative Examples 1 and 2.

Fig. 5 is a descriptive drawing of the glass lens manufactured in Example 1.

Fig. 6 is a descriptive drawing of the glass lens manufactured in Example 2.

Fig. 7 is a descriptive drawing of the glass lens manufactured in Example 3.

Fig. 8 shows change over time in the temperature of the upper mold (concave forming surface), temperature of the lower mold (convex forming surface), and pressure applied in Example 1.

Fig. 9 shows change over time in the temperature of the upper mold (concave forming surface), temperature of the lower mold (convex forming surface), and pressure applied in Example 2.

Fig. 10 shows change over time in the temperature of the upper mold (concave forming surface), temperature of the lower mold (convex forming surface), and pressure applied in Example 3.

Fig. 11 shows change over time in the temperature of the upper mold (concave forming surface), temperature of the lower mold (convex forming surface), and pressure applied in Comparative Example 1.

Fig. 12 shows change over time in the temperature of the upper mold (concave forming surface), temperature of the lower mold (convex forming surface), and pressure applied in Comparative Example 2.

Fig. 13 shows the degree of surface precision of the glass lenses obtained in Example 1-3 and Comparative Example 1 and 2.

Please amend prenumbered paragraph [0015], starting on page 6, as follows:

In Manufacturing Method 1 of the present invention, as shown in Fig. 1(A) and (B), one of the surfaces of the lens is either flat or convex. In this case, cooling during the cooling step is conducted so that the temperature ta2 of the mold with a convex forming or flat forming molding surface reaches the glass transition temperature Tg of the glass being molded before temperature ta1 of the mold with a concave forming molding surface.

Preferably, the cooling conditions are set so that temperature ta1 is at least 5 ~~degree~~ degrees centigrade higher than temperature ta2 when temperature ta2 reaches Tg. In particular, the cooling conditions are set so that temperature ta1 is preferably 5 to 40, more preferably 5 to 30, still more preferably 5 to 20 ~~degree~~ degrees centigrade higher than temperature ta2 when temperature ta2 reaches Tg.

Please amend prenumbered paragraph [0018], starting on page 7, as follows:

Temperature tb2 is preferably lower than temperature tb1 at least at the end of the molding step, and more preferably, temperature tb2 is at least 5 ~~degree~~ degrees centigrade lower than temperature tb1, at least at the end of the molding step. That is, the temperature of the forming mold at the end of pressure application is set so that temperature tb1 of the mold for forming the concave surface ~~(S1)~~ (S2) with the smaller radius of curvature R is at least 5 ~~degree~~ degrees centigrade higher that temperature tb2 of the mold for forming the concave surface ~~(S2)~~ (S1) with the larger radius of curvature R (tb1-tb2 ≥ 5 ~~degree~~ degrees centigrade).

In particular, temperature tb2 is preferably lower than temperature tb1 from the beginning to the end of the molding step.

Please amend prenumbered paragraph [0019], on page 8, as follows:

Embodiments of the method of manufacturing glass optical elements of the present invention ~~comprises~~ includes (1) a molding step in which a heat-softened glass molding material is press-molded by a forming mold ~~comprising~~ including an upper mold and a lower mold with molding surfaces forming the optically functional surfaces of the glass optical element to be molded, one of these molding surfaces being concave forming and the other

being convex <u>forming</u> or flat <u>forming</u> in Manufacturing Method 1, and both of these molding surfaces being concave <u>forming</u> in Manufacturing Method 2, thereby transferring shapes of the molding surfaces to the glass material being molded; (2) a cooling step in which the forming mold is cooled to cool the molded glass [[to]] below the glass transition temperature (Tg) of the glass; and (3) a removal step in which the cooled glass is removed from the forming mold.

Please amend prenumbered paragraph [0023], on page 10, as follows:

The difference in temperature for example, (t1-t2 ≥ 5 ~~degree~~ <u>degrees</u> centigrade) in the upper and lower two molds may be applied from the start of pressure application for molding, for example. Specifically, the upper mold and the lower mold are heated under different heating conditions. This state is shown in Fig. 3(A). In the figure, (1) is the start of press-molding and (2) is the end of the initial application of pressure. In Fig. 3(A), the condition (t1-t2 ≥ 5 ~~degree~~ <u>degrees</u> centigrade) is already satisfied at the start of press-molding (1). Even when the condition (t1-t2 ≥ 5 ~~degree~~ <u>degrees</u> centigrade) is not satisfied at the start of pressure application for molding, the temperature of the forming mold can be controlled during pressure application for molding so that satisfying (t1-t2) ≥ 5 ~~degree~~ <u>degrees</u> centigrade. In that case, for example, the mold of temperature t2 could be aggressively cooled to achieve (t1-t2) ≥ 5 ~~degree~~ <u>degrees</u> centigrade during the application of pressure for molding. Fig. 3(B) shows that state. In this figure, as well, (1) denotes the start of press-molding and (2) denotes the end of the initial application of pressure. In Fig. 3(B), at the start of press-molding (1), the temperature difference satisfies t1-t2 < 5 ~~degree~~ <u>degrees</u> centigrade and then the mold of temperature t2 is aggressively cooled so that (t1-t2 ≥ 5 ~~degree~~ <u>degrees</u> centigrade) is satisfied at the end of the initial application of pressure (2). In

Fig. 3(B), the temperature difference can be $t1=t2$ at point (1) and then temperature adjustment can be made to satisfy ($t1-t2 \geq 5$ ~~degree~~ degrees centigrade) at the end of initial application of pressure (2).

Please amend prenumbered paragraph [0024], starting on page 10, as follows:

In one of the preferred embodiments, so long as the temperature difference (t1-t2) between the upper and lower molds is at least 5 ~~degree~~ degrees centigrade at the end of the initial application of pressure, glass optical elements (for example, lenses) can be obtained with little distortion and good surface precision. In that case, the temperature difference (t1-t2) in the two molds preferably falls within the range of from 10-20 ~~degree~~ degrees centigrade at least at the end of the initial application of pressure.

Please amend prenumbered paragraph [0025], on page 11, as follows:

In the method of the present invention, from the perspective of reducing nonuniformity in glass contraction resulting from the cooling step following application of pressure and from the perspective of reducing the amount of distortion, desirable is cooling in such a manner that the temperature difference (t1-t2) between the two molds becomes at least 5 ~~degree~~ degrees centigrade before the temperature of the mold forming the flat or convex surface, or the mold forming the concave surface with the larger radius of curvature R, reaches Tg.

Please amend prenumbered paragraph [0029], starting on page 12, as follows:

The upper mold (concave forming surface) temperature, lower mold (convex forming surface) temperature, and various changes in pressure applied over time are shown in Fig. 8.

The temperature (ta1) of the upper mold (concave forming surface) was 610 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold (convex forming surface) was 590 ~~degree~~ degrees centigrade at the start of press-molding, with a difference in temperature between the two being 20 ~~degree~~ degrees centigrade. During press-molding, these temperatures were maintained; the temperature (ta1) of the upper mold ~~(concave surface)~~ was also 610 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was also 590 ~~degree~~ degrees centigrade at the end of the initial application of pressure, with a difference in temperature between the two of 20 ~~degree~~ degrees centigrade. Cooling progressed, and the temperature (ta1) of the upper mold ~~(concave surface)~~ when the temperature (ta2) of the lower mold ~~(convex surface)~~ reached the glass material Tg of 535 ~~degree~~ degrees centigrade was 545 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 10 ~~degree~~ degrees centigrade. Further, the difference between temperature (ta2) of the lower mold ~~(convex surface)~~ and temperature (ta1) of the upper mold ~~(concave surface)~~ at the end of second pressure application was 4 ~~degree~~ degrees centigrade.

Please amend prenumbered paragraph [0030], on page 13, as follows:

Example 2

The glass lens (ratio b/a=2.5, concave meniscus lens) of the shape shown in Fig. 6, one surface of which was concave (radius of curvature R=17 mm) and the other surface of which was convex (radius of curvature R=23 mm) was manufactured. The concave surface was formed with the upper mold and the convex surface with the lower mold. LaC13 (Tg=520 ~~degree~~ degrees centigrade, Ts=560 ~~degree~~ degrees centigrade) was employed as the glass material. The molding conditions are given in Table 1.

Please amend prenumbered paragraph [0031], starting on page 13, as follows:

The temperature of the upper mold (concave forming surface), the temperature of the lower mold (convex forming surface), and the various changes in pressure applied over time are given in Fig. 9. The temperature (ta1) of the upper mold (concave forming surface) was 600 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold (convex forming surface) was 580 ~~degree~~ degrees centigrade at the start of press-molding, with a difference in temperature between the two of 20 ~~degree~~ degrees centigrade. During press-molding, the temperature (ta1) of the upper mold ~~(concave surface)~~ was gradually decreased. The temperature (ta1) of the upper mold ~~(concave surface)~~ was 590 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was 580 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 10°C, at the end of the initial application of pressure. Cooling progressed, and the temperature (ta1) of the upper mold ~~(concave surface)~~ when the temperature (ta2) of the lower mold ~~(convex surface)~~ reached the glass material Tg of 520 ~~degree~~ degrees centigrade was 528 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 8 ~~degree~~ degrees centigrade. Further, the difference between temperature (ta2) of the lower mold ~~(convex surface)~~ and temperature (ta1) of the upper mold ~~(concave surface)~~ at the end of second pressure application was 1 degree centigrade.

Please amend prenumbered paragraph [0032], on page 14, as follows:

Example 3

The glass lens (ratio b/a=3.0, double-concave lens) of the shape shown in Fig. 7, one surface of which was concave (radius of curvature R=38 mm) and the other surface of which

was also concave (radius of curvature R=180 mm) was manufactured. The concave surface with the smaller R was formed with the upper mold and the concave surface with the greater R was formed with the lower mold. LaC13 (Tg=520 ~~degree~~ degrees centigrade, Ts=560 ~~degree~~ degrees centigrade) was employed as the glass material. The molding conditions are given in Table 1.

Please amend prenumbered paragraph [0033], starting on page 14, as follows:

The temperature of the upper mold (~~lower~~ smaller R concave forming surface), the temperature of the lower mold (~~higher~~ greater R concave forming surface), and the various changes in pressure applied over time are given in Fig. 10. The temperature (tb1) of the upper mold ~~(lower R concave surface)~~ was 600 ~~degree~~ degrees centigrade and the temperature (tb2) of the lower mold ~~(higher R concave surface)~~ was 580 ~~degree~~ degrees centigrade at the start of press-molding, with a difference in temperature between the two of 20 ~~degree~~ degrees centigrade. During press-molding, the temperature (tb1) of the upper mold ~~(lower R concave surface)~~ was gradually decreased. The temperature (tb1) of the upper mold ~~(lower R concave surface)~~ was 595 ~~degree~~ degrees centigrade and the temperature (tb2) of the lower mold ~~(higher R concave surface)~~ was 580 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 15 ~~degree~~ degrees centigrade, at the end of the initial application of pressure. Cooling progressed, and the temperature (tb1) of the upper mold ~~(lower R concave surface)~~ when the temperature (tb2) of the lower mold ~~(higher R concave surface)~~ reached the glass material Tg of 520 ~~degree~~ degrees centigrade was 530 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 10 ~~degree~~ degrees centigrade. Further, the difference between temperature (tb2) of the lower mold

~~(higher R concave surface)~~ and temperature (tb1) of the upper mold ~~(lower R concave surface)~~ at the end of second pressure application was 2 ~~degree~~ degrees centigrade.

Please amend prenumbered paragraph [0034], on page 15, as follows:

With the exception that the temperatures of the upper and lower molds given in Table 1 were made identical, a glass lens was formed in the same manner as in Example 1. The temperature of the upper mold (concave forming surface), lower mold (convex forming surface), and various changes in pressure applied over time are given in Fig. 11.

Please amend prenumbered paragraph [0035], starting on page15, as follows:

The temperature (ta1) of the upper mold ~~(concave surface)~~ was 600 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was also 600 ~~degree~~ degrees centigrade at the start of press-molding, with the difference in temperature between the two being 0 ~~degree~~ degrees centigrade. During press-molding, these temperatures were maintained; the temperature (ta1) of the upper mold ~~(concave surface)~~ was also 600 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was also 600 ~~degree~~ degrees centigrade at the end of the initial application of pressure, with a difference in temperature between the two of 0 ~~degree~~ degrees centigrade degree centigrade. Cooling progressed, and the temperature (ta1) of the upper mold ~~(concave surface)~~ when the temperature (ta2) of the lower mold ~~(convex surface)~~ reached the glass material Tg of 535 ~~degree~~ degrees centigrade was 535 ~~degree~~ degrees centigrade, with a difference in temperature between the two of 0 ~~degree~~ degrees centigrade. Further, the difference between temperature (ta2) of the lower mold ~~(convex surface)~~ and temperature (ta1) of the upper mold ~~(concave surface)~~ at the end of second pressure application was 0 ~~degree~~ degrees centigrade.

Please amend prenumbered paragraph [0036], starting on page 16, as follows:

Comparative Example 2

With the exception that the temperature of the upper mold (concave forming surface) was made lower than the temperature of the lower mold (convex forming surface) as shown in Table 1, a glass lens was molded in the same manner as in Example 1. The upper mold ~~(concave surface)~~ temperature, lower mold ~~(convex surface)~~ temperature, and various changes in pressure applied over time are shown in Fig. 12. The temperature (ta1) of the upper mold ~~(concave surface)~~ was 595 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was 605 ~~degree~~ degrees centigrade at the start of press-molding, with the difference in temperature between the two being -10 ~~degree~~ degrees centigrade. During press-molding, the temperature (ta1) of the upper mold ~~(concave surface)~~ was gradually increased. The temperature (ta1) of the upper mold ~~(concave surface)~~ was 600 ~~degree~~ degrees centigrade and the temperature (ta2) of the lower mold ~~(convex surface)~~ was 605 ~~degree~~ degrees centigrade at the end of the initial application of pressure, with a difference in temperature between the two of -5 ~~degree~~ degrees centigrade. Cooling progressed, and the temperature (ta1) of the upper mold ~~(concave surface)~~ when the temperature (ta2) of the lower mold ~~(convex surface)~~ reached the glass material Tg of 535 ~~degree~~ degrees centigrade was 533 ~~degree~~ degrees centigrade, with a difference in temperature between the two of -2. ~~(ta1) of the upper mold (concave surface) when the temperature (ta2) of the lower mold (convex surface) reached the glass material Tg of 535 degree centigrade was 533 degree centigrade, with a difference in temperature between the two of -2.~~ Further, the difference between temperature (ta2) of the lower mold ~~(convex~~

~~surface)~~ and temperature (ta1) of the upper mold ~~(concave surface)~~ at the end of second pressure application was 0 ~~degree~~ degrees centigrade.

Please amend prenumbered paragraph [0039], on page 17, as follows:

As shown in Table 1, increasing the upper mold (concave forming surface) temperature above the lower mold (convex forming surface) temperature so that temperature ta2 of the mold with a convex forming surface ~~that was convex~~ or flat forming surface reached Tg before temperature ta1 of the mold with a concave forming surface, yielded glass optical elements having good surface precision.

Please amend the Abstract on page 23 as follows:

ABSTRACT

~~Provided is a~~ A method for manufacturing a glass optical element having at least one concave surface, ~~comprising the following steps~~ including: softening a glass molding material by heating, molding the softened material with a first mold having a first molding surface and a second mold having a second molding surface by applying a pressure, the first molding surface ~~comprising~~ including a first concave forming surface, the second molding surface ~~comprising~~ including a convex forming surface, a planar forming surface or a second concave forming surface, the second concave forming surface having a curvature radius greater than that of [[said]] the first concave forming surface, whereby ~~shapes of the first molding surface and the second molding surface are transferred to the material, cooling~~ the applying of the pressure starts when the first mold and the second mold are at temperatures above a glass transition temperature of said glass molding material, the glass material is cooled so that a temperature of the glass material reaches a temperature equal to or lower than a glass

transition temperature (Tg) of the glass material, and ~~removing~~ the cooled glass material is removed from either of [[said]] the first mold or [[said]] the second mold. ~~In the method, a~~ A second temperature of [[said]] the second mold reaches the glass transition temperature prior to a time when a first temperature of [[said]] the first mold reaches the glass transition temperature in the cooling step.